

## **QVS QPE vs Gauge Stats – Feb 2012**

No missing gauges (gauge = -99) or gauges with missing qpe (qpe = -99) are ever used in the calculations. Gauges and/or QPE's of zero are used unless thresholding or gauge ranges are not specified additionally.

N = Total number of gauge/qpe pairs in the sample being considered

$$\text{Avg Gauge} = g_{\text{avg}} = (g_1 + g_2 + g_3 + \dots + g_N)/N$$

$$\text{Gauge STD} = ((g_1 - g_{\text{avg}})^2 + (g_2 - g_{\text{avg}})^2 + \dots + (g_N - g_{\text{avg}})^2)/N)^{0.5}$$

$$\text{Avg QPE} = q_{\text{avg}} = (q_1 + q_2 + q_3 + \dots + q_N)/N$$

$$\text{QPE STD} = ((q_1 - q_{\text{avg}})^2 + (q_2 - q_{\text{avg}})^2 + \dots + (q_N - q_{\text{avg}})^2)/N)^{0.5}$$

$$\text{Mean Bias (Q/G)} = q_{\text{avg}}/g_{\text{avg}}$$

$$\text{Additive Bias (Q-G)} = (q_1 - g_1) + (q_2 - g_2) + \dots + (q_N - g_N) = (\text{Mean Error})N$$

$$\text{Mean Error (Q-G)} = ((q_1 - g_1) + (q_2 - g_2) + \dots + (q_N - g_N))/N = \text{Additive Bias}/N = q_{\text{avg}} - g_{\text{avg}}$$

$$\text{Mean Abs Error} = (|q_1 - g_1| + |q_2 - g_2| + \dots + |q_N - g_N|)/N$$

$$\text{RMSE} = ((q_1 - g_1)^2 + (q_2 - g_2)^2 + \dots + (q_N - g_N)^2)/N)^{0.5}$$

$$\text{Q-G Error Std Dev} = \text{Standard deviation of the } (q_i - g_i) \text{ values} =$$

$$[ ((q_1 - g_1) - (q_{\text{avg}} - g_{\text{avg}}))^2 + ((q_2 - g_2) - (q_{\text{avg}} - g_{\text{avg}}))^2 + \dots + ((q_N - g_N) - (q_{\text{avg}} - g_{\text{avg}}))^2 ]/N ]^{0.5}$$

$$\text{Correlation Coeff} = (\text{Sum 1})/[(\text{Sum 2})(\text{Sum 3})]$$

$$\text{Sum 1} = (q_1 - q_{\text{avg}})(g_1 - g_{\text{avg}}) + (q_2 - q_{\text{avg}})(g_2 - g_{\text{avg}}) + \dots + (q_N - q_{\text{avg}})(g_N - g_{\text{avg}})$$

$$\text{Sum 2} = (q_1 - q_{\text{avg}})^2 + (q_2 - q_{\text{avg}})^2 + \dots + (q_N - q_{\text{avg}})^2$$

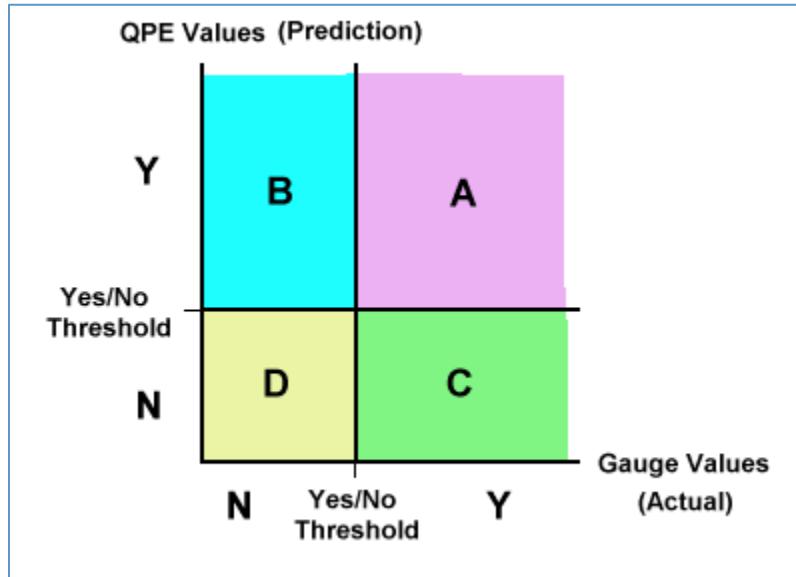
$$\text{Sum 3} = (g_1 - g_{\text{avg}})^2 + (g_2 - g_{\text{avg}})^2 + \dots + (g_N - g_{\text{avg}})^2$$

$$\text{Fractional Bias} = (\text{Mean Error}/\text{Avg Gauge})$$

$$\text{Fractional RMSE} = (\text{RMSE}/\text{Avg Gauge})$$

$$\text{Fractional Std Dev} = [(RMSE)^2 + (\text{Mean Error})^2]/\text{Avg Gauge}$$

### Contingency Table Functions:



$$N = A + B + C + D$$

$$\text{Probability of Detection} = A / (A + C)$$

$$\text{False Alarm Rate} = B / (A + B)$$

$$\text{Equitable Threat Score} = (A - E) / (A + B + C - E), \text{ where } E = (A + B)(A + C) / N$$

$$\text{Heidke Skill Score} = [2(AD - BC)] / [(A + C)(C + D) + (A + B)(B + D)]$$

$$\text{Pierce Skill Score} = (AD - BC) / [(A + C)(B + D)]$$